Health Consultation

GULFCO MARINE MAINTENANCE
FISH AND CRAB DATA

FREEPORT, BRAZORIA COUNTY, TEXAS

EPA FACILITY ID: TXD055144539

FEBRUARY 13, 2008

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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HEALTH CONSULTATION

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Prepared By:

Texas Department of State Health Services
Under a Cooperative Agreement with the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

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Purpose and Statement of Issues

In response to an Environmental Protection Agency (EPA) request, the Texas Department of State Health Services (DSHS), Health Assessment and Toxicology Program evaluated the public health implications of ingestion of fish and crab from the Intracoastal Waterway near the Gulfco Marine Maintenance Superfund site in Freeport, Texas.
(Note: Appendix A lists abbreviations and acronyms used in this report).

Background

Site Description and History

The Gulfco Marine Maintenance Superfund site is a former barge cleaning facility located in Freeport, Texas. The site encompasses 40 acres on the Intracoastal Waterway. In 2004, DSHS prepared a Public Health Assessment for the site under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR) [1]. Contaminants in soil and sediment were found to pose no apparent public health hazard, and the groundwater pathway posed no public health hazard. The seafood consumption, surface water, and air pathways were categorized as indeterminate public health hazards because at that time no data were available for evaluation of those pathways.

As part of the remedial investigation for the Gulfco Marine Maintenance Superfund site and in response to community concerns, fish and crab samples were collected from the Intracoastal Waterway near this site. The results of our preliminary analysis of the fish and crab data were presented in a letter to EPA [2]. A detailed analysis is provided in this health consultation.

In July 2007, a fact sheet was prepared by EPA and DSHS. This fact sheet provided information on current and future activities at the site, as well as a summary of our preliminary analysis of the fish and crab data. The fact sheet was mailed to citizens in the Freeport area.

Discussion

Environmental Sampling

Data available for this health consultation include fish and crab sample data collected by Benchmark Ecological Services, Inc. (BES) and EPA during November and December 2006. Red drum (6 samples), southern flounder (9 samples), spotted sea trout (9 samples), and blue crab (9 samples) were collected by BES and analyzed for a series of contaminants that had been detected in the sediment of the Intracoastal Waterway. These contaminants included several polycyclic aromatic hydrocarbons (PAHs) (benzo(a)anthracene, benzo(a)pyrene or BaP, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene), pesticides (4,4´-DDE (dichlorodiphenyldichloroethylene), 4,4´-DDT (dichlorodiphenyltrichloroethane), and hexachlorobenzene), and metals (lead and silver) [3]. The EPA collected sample splits from blue crab (1 sample), southern flounder (1 sample), and speckled sea trout (2 samples) and analyzed these samples for all PAHs, pesticides, and metals [4]. For this consultation, DSHS relied on the information provided in the referenced documents

and assumed adequate quality assurance/quality control procedures were followed with regard to data collection, chain-of-custody, laboratory procedures, and data reporting.

Public Health Implications

Exposure to chemical contaminants drives the ATSDR health consultation process. People may be adversely affected by chemicals only if exposure occurs; that is, they must come into contact with the chemicals or absorb the chemicals into their bodies. The presence of chemical contaminants in the environment does not always result in contact, and contact does not always result in the chemical being absorbed into the body. Thus, chemicals have the potential to cause adverse health effects only when people actually come into contact with them through a completed exposure pathway. Whether adverse health effects are possible depends on: 1) the toxicological properties of the chemicals; 2) the manner in which the person contacts the chemical; 3) the concentration of the chemical; 4) how often the exposure occurs; 5) how long the exposure occurs; and 6) how much of the chemical is absorbed into the body during each exposure event.

Pathways Analysis

The most common ways people come into contact with chemicals are by inhalation (breathing), ingestion (eating or drinking), or by dermal contact (contact with or absorption through skin) with a substance containing the contaminant. The exposure pathway of concern for this health consultation is ingestion of fish and crab taken from the Intracoastal Waterway near the Gulfco Marine Maintenance Superfund site. This is a potential pathway because we do not know how many recreational fishers in the area are actually eating the fish from the Intracoastal Waterway. Anecdotal evidence indicates it is more likely that recreational fishing involves catch and release, and we are not aware of any subsistence fishing in the area. Other exposure pathways have already been addressed in the Public Health Assessment, or will be evaluated as data becomes available.

Determining Contaminants of Concern

To determine the potential health risks associated with the contaminants found in the fish and crab samples, we compared each contaminant with its media-specific health-based assessment comparison (HAC) value for non-cancer and cancer endpoints. These values are guidelines that specify levels of chemicals in specific environmental media that are considered safe for human contact with respect to identified adverse health effects.

Non-cancer screening values are based on the ATSDR's minimal risk levels (MRLs)[1] or EPA's reference doses (RfDs)[2]. Both of these are based on the assumption that there is an identifiable

[1] An MRL is a contaminant specific exposure dose below those which might cause adverse health effects in the people most sensitive to such chemical-induced effects. MRLs generally are based on the most sensitive chemical-induced end point considered to be of relevance to humans.
[2] An RfD is an estimate (with a level of uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive groups) that is likely to be without appreciable risk of deleterious effects during a lifetime.

exposure threshold (both for the individual and for populations) below which there are no observable adverse effects. Therefore, MRLs and RfDs are estimates of daily exposures to contaminants that are unlikely to cause adverse non-cancer health effects even if exposure occurs for a lifetime. Screening values for non-cancerous health effects (NC-HAC) were derived using seafood intake rates of 15 grams per day (g/day) for children and 30 g/day for adults, body weights of 16 kilograms (kg) for children and 70 kg for adults, the MRL or RfD for each contaminant, and two meals of seafood collected from the Intracoastal Waterway per week.

For each contaminant considered to be a known human carcinogen, probable human carcinogen, or possible human carcinogen, a 1 in 1 million (1×10^{-6}) cancer risk and the cancer slope factor were used in addition to the above parameters to determine the screening values for cancerous health effects (C-HAC) and the potential for cancerous health effects to develop.

The exposure assumptions used to establish these screening levels are conservative with respect to protecting public health; as a result, actual exposures are likely to be lower than those used to calculate the screening values. Exceeding a screening value does not mean that a contaminant represents a public health threat; rather, it suggests that the contaminant warrants further consideration. Assessing the public health significance of contaminants that exceed their respective screening levels involves reviewing and integrating relevant toxicological information with plausible exposures. We may estimate the magnitude of the public health significance by comparing the estimated exposures to identified "no observed" and "lowest observed" adverse effects levels (NOAELs and LOAELs) in animals and to known effect levels in humans, when available. We assess the public health significance of contaminants that exceed screening values by reviewing and integrating relevant toxicological information with reasonable maximum exposure scenarios.

For those contaminants that exceed screening values for either a cancerous or non-cancerous health effect, the estimated exposure dose and lifetime excess cancer risk were calculated using the maximum concentration of the contaminant detected in the fish and crab samples. For contaminants that were not detected above their analytical detection limit, the detection limit was used as the maximum concentration to assume worst-case scenario. If the detection limit for a given contaminant exceeds the health-based screening value (as was the case for BES data for PAHs and hexachlorobenzene), the method used to analyze the data is not sensitive enough to measure concentrations of potential concern. Therefore, the BES data for these contaminants could not be used to evaluate the potential for adverse health effects to occur due to ingestion of fish and crab from the Intracoastal Waterway. For these contaminants, we relied upon data collected by the EPA.

PAHs are a group of more than 100 different chemicals (including BaP) that are generally found in the environment as mixtures, not as single compounds. Because BaP is perhaps the most toxicologically significant PAH, it was used as a surrogate to assess the potential health risks associated with PAHs in fish and crab. Individual PAH concentrations were compared to screening values for BaP, and the risks associated with individual PAHs were summed to determine risks associated with PAHs as a mixture.

There is no MRL or RfD available for lead. Instead, ATSDR developed an approach to assess the risks associated with exposure to lead in environmental media by estimating the increase in blood lead level associated with that exposure [5]. This method was used to assess the public health implications associated with exposure to lead in fish and crab.

Fish and Crab Data

Based on a review of PAH, pesticide, and metals data collected by EPA, a number of contaminants exceeded NC-HAC or C-HAC in fish and crab tissues (Appendix C, Table). The majority of these compounds had estimated exposure doses below the MRL or RfD or estimated increased risk for cancer less than 1×10^{-5} (or no apparent increased risk for cancer) and therefore we do not expect to see adverse health effects associated with exposure to these contaminants.

Using the data collected by the EPA, arsenic was the only contaminant in which the estimated exposure doses for children and adults exceeded the MRL, and there was a low increased risk of cancer due to exposure to arsenic via ingestion of seafood. Seafood is known to contain the greatest amount of arsenic of all food items; however, in fish and shellfish, the arsenic present is generally in less toxic organic arsenic form. The MRL and associated elevated estimated exposure doses and cancer risk for arsenic are based on the inorganic form, and no risk values have been derived for organic arsenic. Assuming the majority of the arsenic detected in seafood samples from the Intracoastal Waterway is organic arsenic, it is not likely that ingestion of fish and crab collected in this area would pose a human health threat.

Child Health Considerations

In communities faced with air, water, or food contamination, children could be at greater risk than are adults from certain kinds of exposure to hazardous substances. A child's lower body weight and higher intake rate result in a greater dose of hazardous substance per unit of body weight. Sufficient exposure levels during critical growth stages can result in permanent damage to the developing body systems of children. Children are dependent on adults for access to housing, for access to medical care, and for risk identification. Consequently, adults need as much information as possible to make informed decisions regarding their children's health.

We evaluated whether children consuming fish and crab collected from the Intracoastal Waterway near the Gulfco Marine Maintenance Superfund site would be likely to be exposed to contaminants at levels of health concern. We evaluated the potential risk to children by using conservative exposure scenarios where the exposures are likely to be much higher than those children might actually experience.

Conclusions

Based upon our analysis of the November and December 2006 data, we do not expect to see health effects associated with exposure to contaminants in fish and crab collected from the Intracoastal Waterway near the Gulfco Marine Maintenance Superfund site. Therefore

consumption of fish and crab from the Intracoastal Waterway poses no apparent public health hazard.

Recommendations

None at this time.

Public Health Action Plan

Actions Completed

1. During November and December 2006, fish and crab samples were collected by Benchmark Ecological Services, Inc. and EPA and analyzed for PAHs, pesticides, and metals.
2. On June 26, 2007, a preliminary data review was completed by the DSHS Health Assessment and Toxicology Program and a letter summarizing our preliminary conclusions was submitted to EPA.
3. In July 2007, a fact sheet providing information on current and future activities at the site, as well as a summary of our preliminary analysis of the fish and crab data was prepared by EPA and DSHS. This fact sheet was mailed to citizens in the Freeport area.

Action Planned

This health consultation will be made available to EPA and citizens living in the Freeport area.

Authors, Technical Advisors, and Organizations

Report Prepared by
Carrie M. Bradford, MS, PhD
Toxicologist
DSHS Health Assessment & Toxicology Program

Susan Prosperie, MS, RS
Manager
DSHS Exposure Assessment & Surveillance Group

John F. Villanacci, PhD, NREMT-I
Principal Investigator/Manager
DSHS Environmental & Injury Epidemiology and Toxicology Branch

Jennifer Lyke
Regional Representative
ATSDR Region 6

George Pettigrew, PE
Senior Regional Representative
ATSDR Region 6

Jeff Kellam
Environmental Health Scientist
Division of Health Assessment and Consultation
Cooperative Agreement Program Evaluation Branch

References

1. Agency for Toxic Substances and Disease Registry. Public Health Assessment for Gulfco Marine Maintenance. Freeport, Brazoria County, Texas. EPA Facility ID TXD055144539. U.S. Department of Health and Human Services. April 19, 2004.

2. Correspondence. Carrie Bradford, Toxicologist, Texas Department of State Health Services to Gary Miller, Project Manager, Environmental Protection Agency. June 26, 2007.

3. Benchmark Ecological Services, Inc. Summary of Gulfco Marine Maintenance Superfund Site Intracoastal Waterway Finfish and Blue Crab Sampling Study. January 12, 2007.

4. Pace Analytical Services, Inc. Sample Data Summary Package. January 2007.

5. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Lead. Atlanta: US Department of Health and Human Services. July 1999.

Certification

This public health consultation for Gulfco Marine Maintenance, Fish and Crab Data, Freeport, Brazoria County, Texas was prepared by the Texas Department of State Health Services under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methods and procedures existing when the time the public health consultation was initiated. Editorial review was completed by the Cooperative Agreement partner.

Technical Project Officer, CAT, CAPEB, DHAC, ATSDR

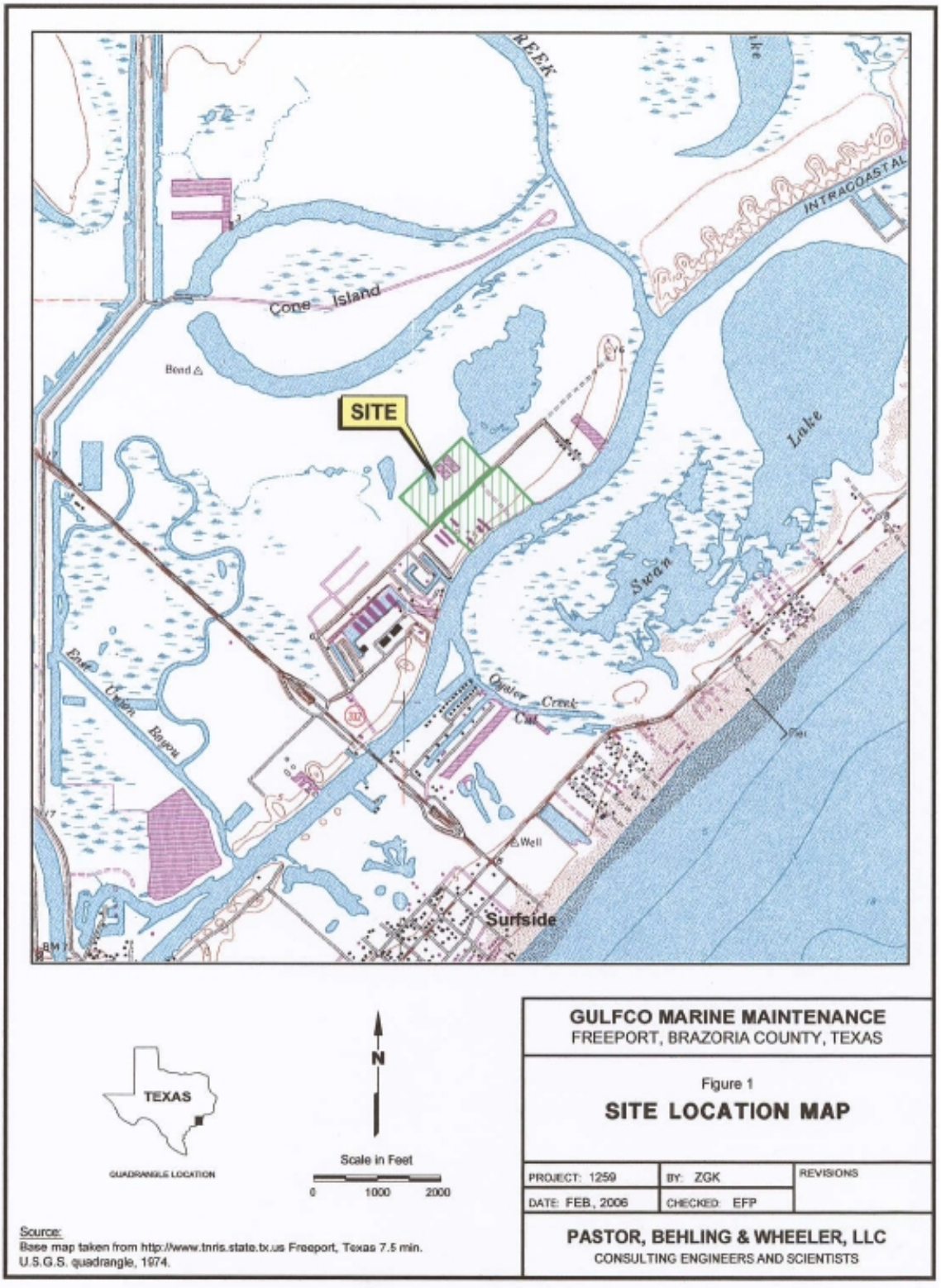
The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health consultation and concurs with its findings.

Team Lead, CAT, CAPEB, DHAC, ATSDR

Appendix A: Acronyms and Abbreviations

ATSDR	Agency for Toxic Substances and Disease Registry
BaP	benzo[a]pyrene
BES	Benchmark Ecological Services, Inc
C-HAC	screening values for cancerous health effects
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DSHS	Texas Department of State Health Services
EPA	Environmental Protection Agency
g/day	grams per day
HAC	health-based assessment comparison
kg	kilograms
LOAEL	lowest observed adverse effects level
mg/kg	milligrams per kilogram
mg/kg/day	milligrams per kilogram per day
MRL	minimal risk level
NC-HAC	Screening values for non-cancerous health effects
NOAEL	no observed adverse effects level
PAH	polycyclic aromatic hydrocarbons
RfD	reference dose

Appendix B: Figure



Appendix C: Table

Table. Contaminants that exceeded calculated[1] non-cancerous (NC) or cancerous (C) HAC values in edible tissues of fish and crab samples.

Contaminant	Maximum Concentration (mg/kg)	HAC value (mg/kg)	Estimated Exposure Dose (mg/kg/day)	Estimated Increased Risk for Cancer[2]
Aldrin	0.001 [3]	0.0001 (C-HAC)		2.1×10^{-6}
Arsenic	2.6	0.002 (C-HAC) 0.3 (child NC-HAC) 0.7 (adult NC-HAC)	0.00069 child[4] 0.00032 adult[4]	4.8×10^{-4}
Alpha-BHC	0.0013 [3]	0.0004 (C-HAC)		1×10^{-6}
Beta-BHC	0.0019 [3]	0.001 (C-HAC)		4.2×10^{-7}
4,4'-DDE	0.033	0.007 (C-HAC)		1.4×10^{-6}
Dieldrin	0.0017 [3]	0.0001 (C-HAC)		3.3×10^{-6}
Heptachlor	0.001 [3]	0.0005 (C-HAC)		5.5×10^{-7}
Heptachlor Epoxide	0.0013 [3]	0.0003 (C-HAC)		1.4×10^{-6}
Hexachlorobenzene	0.0027	0.001 (C-HAC)		5.3×10^{-7}
Mercury	0.11	0.1 (child NC-HAC)	0.000029 child[5]	
Total PAHs	0.0088 [3]	0.0003 (C-HAC)		7.8×10^{-6}
Toxaphene	0.064 [3]	0.002 (C-HAC)		8.6×10^{-6}

[1] Screening values for non-cancerous health effects (NC-HAC) were derived using seafood intake rates of 15 g/day for children and 30 g/day for adults, body weights of 16 kg for children and 70 kg for adults, the MRL or RfD for each contaminant, and two meals of seafood collected from the Intracoastal Waterway per week. For each contaminant considered to be a known human carcinogen, probable human carcinogen, or possible human carcinogen, a 1 in 1 million (1×10^{-6}) cancer risk and the cancer slope factor were used in addition to the above parameters to determine the screening values for cancerous health effects (C-HAC) and the potential for cancerous health effects to develop.
[2] Qualitatively, we interpret estimated increased risk for cancer that are less than 1×10^{-5} as no apparent increased risk for cancer, and we do not expect adverse health effects to occur.
[3] These contaminants were not detected above their analytical detection limit. The detection limit was used as the maximum concentration to assume worst-case scenario.
[4] Estimated exposure doses for arsenic exceed the MRL of 0.0003 mg/kg/day.
[5] Estimated exposure dose for mercury does not exceed the MRL or RfD; therefore we do not expect adverse health effects to occur.